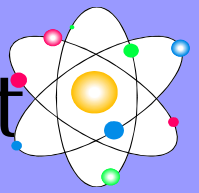
FIRE FIGHTING TECHNIQUES

UNIT 5.4

FIRE FIGHTING TECHNIQUES

- Procedures for Cla

- Procedures for Class C

- Firefighting in t

  Environment

FIRE FIGHTING TECHNIQUES
INITIAL ACTIONS

- Crewmember who discovers fire:
- RRT
- At Sea Fire Party
- Affected Repair Locker

FIRE FIGHTING TECHNIQUES

ISOLATE EQUIPMENT/SYSTEMS/SPACES

- Mechanical Isolation
  - Firefighting Equipment
- Electrical Isolation
  - Lighting / Ventilation
- Magazines
- Flammable Liquid Store Rooms
- Compressed Gas Store Rooms
- Additional hazards to firefighters

FIRE FIGHTING TECHNIQUES

MECHANICAL ISOLATION

MECHANICAL ISOLATION LIST
COMPARTMENT 3-398-0-Q #2 PUMP ROOM

EQUIPMENT	VALVE NUMBER	COMPA
LP AIR VALVES	2-418-1	2-382-0-Q
	2-406-4	2-382-0-Q
	2-412-2	2-387-01-Q
JP-5 XFER VALVES	3-425-1	3-420-0-C
	3-425-13	3-420-0-C

FIRE FIGHTING TECHNIQUES

ELECTRICAL ISOLATION

ELECTRICAL ISOLATION LIST
COMPARTMENT 3-398-0-Q #2 PUMP ROOM

EQUIPMENT LOCATION		CIRCUIT	BREAKER	
JP-5 XFER PUMP	Norm	3SA-4P(3-422-2)		3S SWBD
	Alt	31-4P(3-422-2)		LC 31
JP-5 SERVICE PUMP	Norm	3SA-4P(3-422-1)		3S SWBD
	Alt	31-4P(3-422-1)	LC 31	
#3 AC COMPRESSOR	Norm	3SA-4P(3-420-1)		3S SWBD
	Alt	31-4P(3-420-1)	LC 31	
EXHAUST 01-395-2	Norm	3SA-4P(3-421-1)		3S SWBD
	Alt	31-4P(3-421-1)		LC 31

VENTILATION CONTROL

	FAN	START AT	DAMPERS
SUPPLY	01-395-2 01-388-1-L	1-382-01-L	1-412-1
EXHAUST	01-395-2	1-382-01-L	1-397-2

NATURAL VENTILATION/ RECIRC VENTILATION

NONE

SMOKE CLEARANCE

WTD 3-423-1 TO 3-418-1-T
WTH 1-419-1 TO 1-382-01-L
WTD 1-426-1 TO 1-426-1-L
WTD 1-452-14 TO FAN TAIL
SMOKE CURTAIN @ ARCH FR 424(S)

MAKE UP AIR
OPEN WTD 01-418-4, WTH 01-385-2
WTH 1-388-2, WTD 3-398-2
SMOKE CURTAIN FTD 01-385-2

DANGER HAZARDS

WITHIN COMPARTMENT	EXTERNAL TO COMPARTMENT
JP-5 SERVICE PUMPS JP-5 XFER PUMP JP-5 COALESCERS SPARE FREON (3) FR 398(S)	LAUNDRY TOPSIDE (BLEACH) HT SHOP (COMPRESSED GAS CYLINDERS

COMPARTMENT #

3-398-0-Q

NOUN NAME

JP-5 PUMP ROOM

FRAME NUMBERS

398 - 426

REPAIR LOCKER #

REPAIR 3

FIREFIGHTING EQUIPMENT

WITHIN COMPARTMENT

FIXED	PORTABLE
NONE	2 - 27# PKP EXT 1 - 15# CO2 EXT

EXTERNAL TO COMPARTMENT

AFFF SPRINKLING COV 2-414-2 COMPT 2-382-2-L FPL 1-376	2 - 15# CO2 EXT 2 - 18# PKP EXT LIN 3-384-01-L

DE-WATERING

INSTALLED EDUCTOR FRAME 426 PORT

ELECTRICAL ISOLATION

SUP VENT 01-318-1
NORM 3SA-4P-(1-426-2)
ALT 31-4P-(1-426-1)

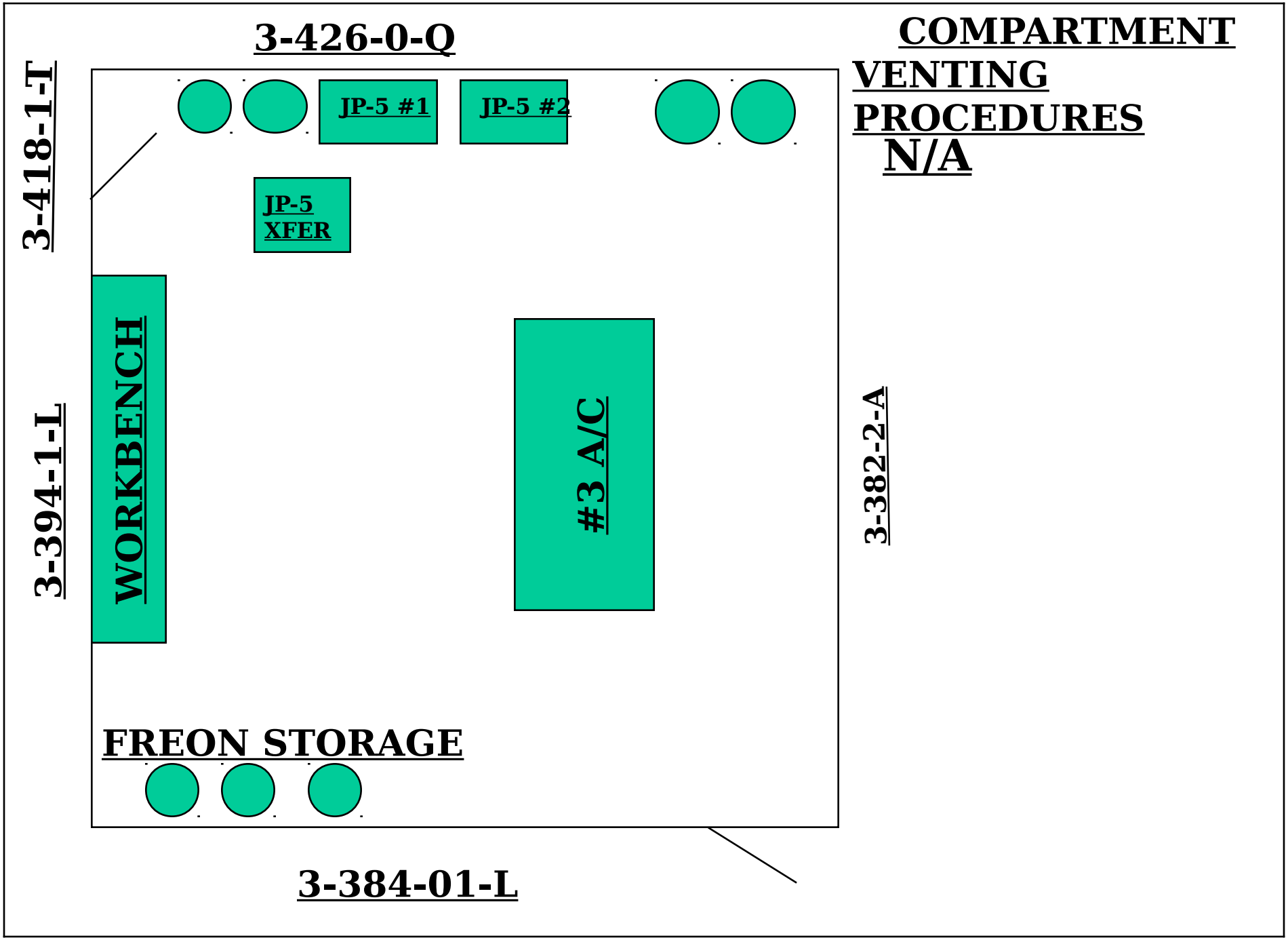
EXHAUST VENT 01-395-2
NORM 3SA-4P-(1-426-1)
ALT 31-4P-(1-426-1)

JP-5 SVC AND XFER PUMPS
NORM 3SA-4P-(3-422-2)
ALT 31-4P-(3-422-2)
#3 A/C & CHW 4SA-4P-31

MECHANICAL ISOLATION

LP AIR VALVES
2-413-3, 2-414-1, 2-406-4

JP-5 XFER VALVES
3-425-5, 3-425-13


3-426-0-Q
COMPARTMENT VENTING PROCEDURES N/A
3-418-1-T
JP-5 #1
JP-5 #2
JP-5 XFER
WORKBENCH
#3 A/C
3-394-1-L
3-382-2-A
FREON STORAGE
3-384-01-L

USS JOHN HANCOCK
CLASS ALPHA FIRE RADIO CENTRAL

- Excessive stowage of burn bags in Radio Central ignited during performance of electronics repairs
- Fire Party delayed arriving on scene due to ship passing Security alert concurrent with fire (possible “terrorist activity”)
- Damage totaled $1.2 million

USS JOHN HANCOCK
CLASS ALPHA FIRE RADIO CENTRAL (Cont'd)

- Electrical Isolation was UNSAT!
  - Entire Load Center for that section of ship was de-energized resulting in a loss of power to:
    - ONLY OPERATING FIRE PUMP
    - RADIO CENTRAL CIPHER LOCK
      - Duty Radioman left key in space
  - ***ELECTRONICS GEAR IN RADIO CENTRAL HAD POWER AVAILABLE THROUGHOUT!***

USS JOHN HANCOCK
CLASS ALPHA FIRE RADIO CENTRAL (Cont'd)

- Fire party was unfamiliar with layout of Radio
- Watchbills were not monitored, Emergency reliefs NOT ON BOARD
- Firefighters reported that NFTI whited out immediately after space was accessed due to high heat

USS JOHN HANCOCK
CLASS ALPHA FIRE RADIO CENTRAL (Cont'd)

- Some OBA's donned incorrectly, removed before the space was desmoked/tested
- Central firefighting control overridden by "Khaki Conga Line" at the scene
- >50% of Fire Party NOT PQS Qualified

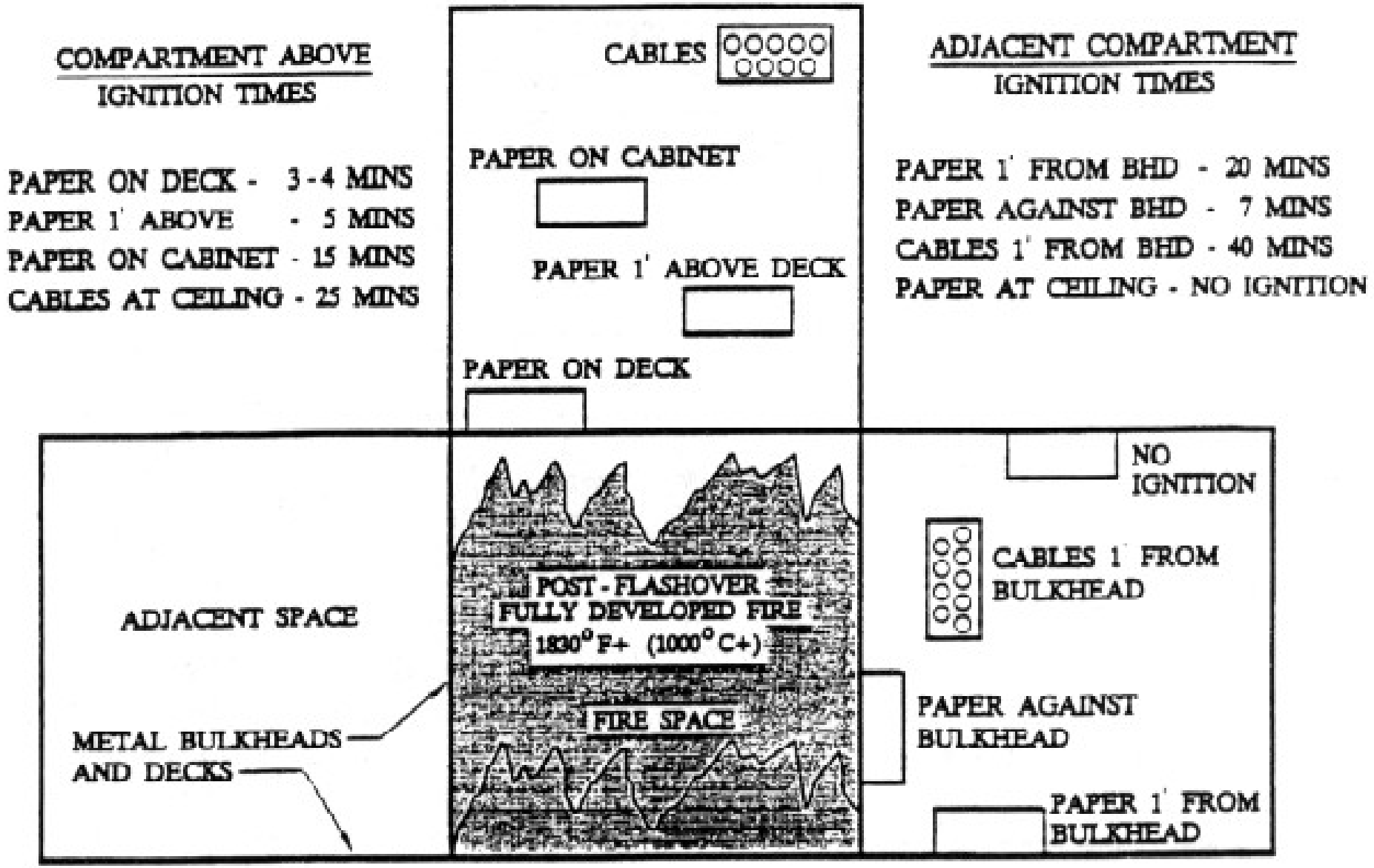
FIRE FIGHTING TECHNIQUES

CONTAINMENT (FIRE BOUNDARIES)

- PRIMARY
  - ANY physical boundary can be a primary fire boundary - NO TIGHTNESS REQUIREMENTS
  - Bulkheads, overhead and deck closest to and surrounding the fire. All six sides of fire affected space
  - Primary emphasis must be on vertical boundary to prevent vertical fire spread
  - Decision to man with charged hoses rests with the Repair Locker Leader (need not be manned if fire insulation is installed on the fire affected side)

FIRE FIGHTING TECHNIQUES
CONTAINMENT (FIRE BOUNDARIES)

- PRIMARY (cont'd)
  - OBA worn by boundarymen as required
  - Remove ALL combustibles
  - Cool boundaries as needed with the SMALLEST amount of water required to minimize steam formation
  - May be manned by a single person with a $1^{1/2}$ inch hose



FIRE SPREAD BY CONDUCTION - IGNITION THRESHOLDS

FIRE FIGHTING TECHNIQUES
CONTAINMENT (FIRE BOUNDARIES)

- SECONDARY
  - Next bulkhead, overhead and deck outside the primary boundary
  - Manned when fire spreads past primary boundaries

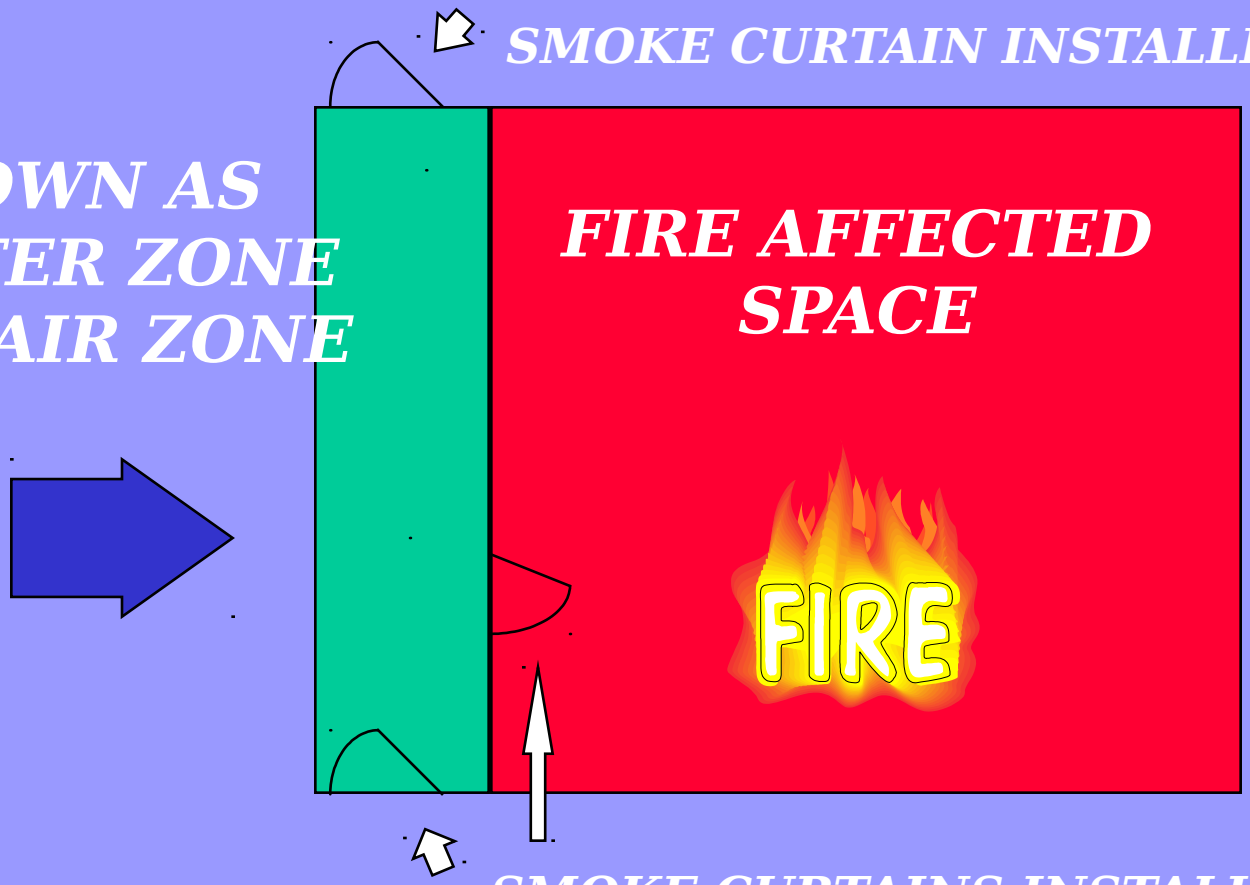
FIRE FIGHTING TECHNIQUES
CONTAINMENT (SMOKE BOUNDARIES)

- ***A closed fitting is the best smoke boundary!***
- Must be established immediately to prevent evacuation of the area
- Primary normally coincides with the primary fire boundary
- Area between primary and secondary smoke boundaries is designated the “Smoke Control Zone”

FIRE FIGHTING TECHNIQUES
CONTAINMENT (SMOKE BOUNDARIES)

- OBA's required in smoke control zone
- ALL ventilation in smoke control zone secured until after space access is completed if active desmoking will be accomplished
- Portable smoke curtains and blankets to be used when access is used by firefighters
- Preposition smoke curtains in critical areas
- Training in the use of smoke curtains and blankets is critical - DON’T SIMULATE

SMOKE CONTROL ZONE



FIRE FIGHTING TECHNIQUES

SCENE LEADER THOUGHT PROCESS

- Determine number of hoses required and direction of attack
- Determine Personal Protective Equipment required
- Determine lighting requirements in fire affected space
- Determine the need for a NFTI
- Determine venting / desmoking options

FIRE FIGHTING TECHNIQUES

ATTACK OPTIONS

- Direct Attack - Preferred method
- Fog Attack - Used when:
  - Overhead gases are burning (Rollover)
  - Seat of fire is obstructed
  - Multiple seats of fire present
- Indirect Attack
- Venting Options
- Attacking from space above
- Vertical Trunk entry

FIRE FIGHTING TECHNIQUES

HOSE HANDLING

- Preliminary Actions to Ensure Readiness
  - Proper stowage of hoses
  - Hand tight couplings
  - Hoses in good condition
  - Hose reel brakes properly set
- Controlling the Hose
  - One person can operate an $1^{1/2}$ inch hose in initial attack, sustained operation requires a minimum of 2 hose handlers in addition to the nozzleman (requirements increase based on hose length and number of turns)

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Controlling the Hose (cont'd)
  - Two people can operate a $2^{1/2}$ inch hose in initial attack, sustained operation requires a minimum of 4 hose handlers in addition to the nozzleman (requirements increase based on hose length and number of turns)
- Teamwork / Coordination is the key to Success!

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Advancing the Hose
  - Advance to nearest location possible to affected space prior to charging
  - With hose completely off camel back, charge hose, straighten kinks and check for leaks
  - Non-collapsible hoses may be charged while still on the reel (ability to advance is limited by strength of individual)

Experience has shown that hoses expand when charged, causing difficulty removing from hose reel

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Advancing the Hose (cont'd)
  - When maneuvering below decks place all hose handlers on the same side of the hose for ease of movement in narrow areas
  - When using 2 hoses, place hose handlers on outside of hoses to minimize interference

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Attack Team Relief
  - Attack hose may be left in fire affected space during relief process / Team Leader responsible for informing OSL of nozzle location and space conditions
  - It is NOT NECESSARY to close the plug valve while doing so

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Nozzle Handling / The Nozzleman must:
  - Direct the hose stream where desired
  - Use the appropriate spray pattern
  - Use the appropriate flow rate
  - Devote one hand to holding the nozzle and directing the stream, leaving the other hand available to operate the bail shut-off handle and the pattern shroud

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Nozzle Handling
  - The nozzleman may hold the hose line over the shoulder or under an arm whichever is more comfortable
- WARNING - WHEN HOLDING THE HOSE UNDER THE ARM THE OBA BREATHING BAG MAY BECOME DEFLATED IF PRESSED ON BY THE HOSE
- Nozzle control is critical

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Nozzle Handling
  - Straight stream / Used in direct attack
  - Narrow angle fog / General firefighting pattern, good for providing a “push” to flame fronts
  - Wide angle fog / Good heat absorption, used for personnel protection

FIRE FIGHTING TECHNIQUES
HOSE HANDLING

- Hose stream reach in no wind w/nozzle pressure of 100 PSI
  - Straight stream 100 feet
  - Narrow angle fog 50 feet
  - Wide angle fog 5-10 feet

FIRE FIGHTING TECHNIQUES
SPACE REENTRY

- Position firefighters on the non-hinged side of door, hoseline ready. Stay low!
  - When door is opened, if fire shows or rolls out, direct water fog at the doorway overhead for cooling and control of escaping gases.
  - When conditions permit, Team Leader enter the space and assess conditions. Remain low!

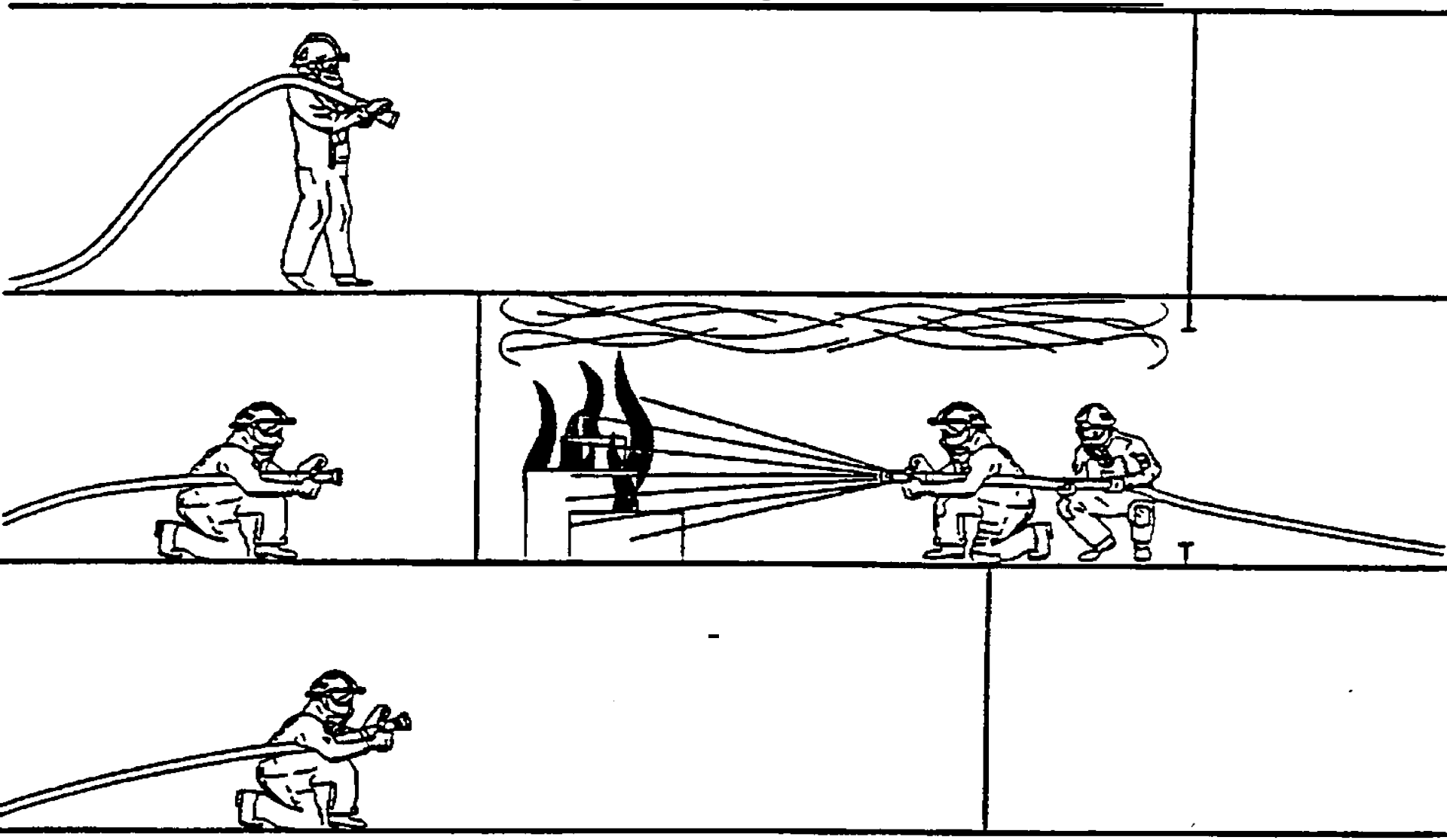
FIRE FIGHTING TECHNIQUES
SPACE REENTRY

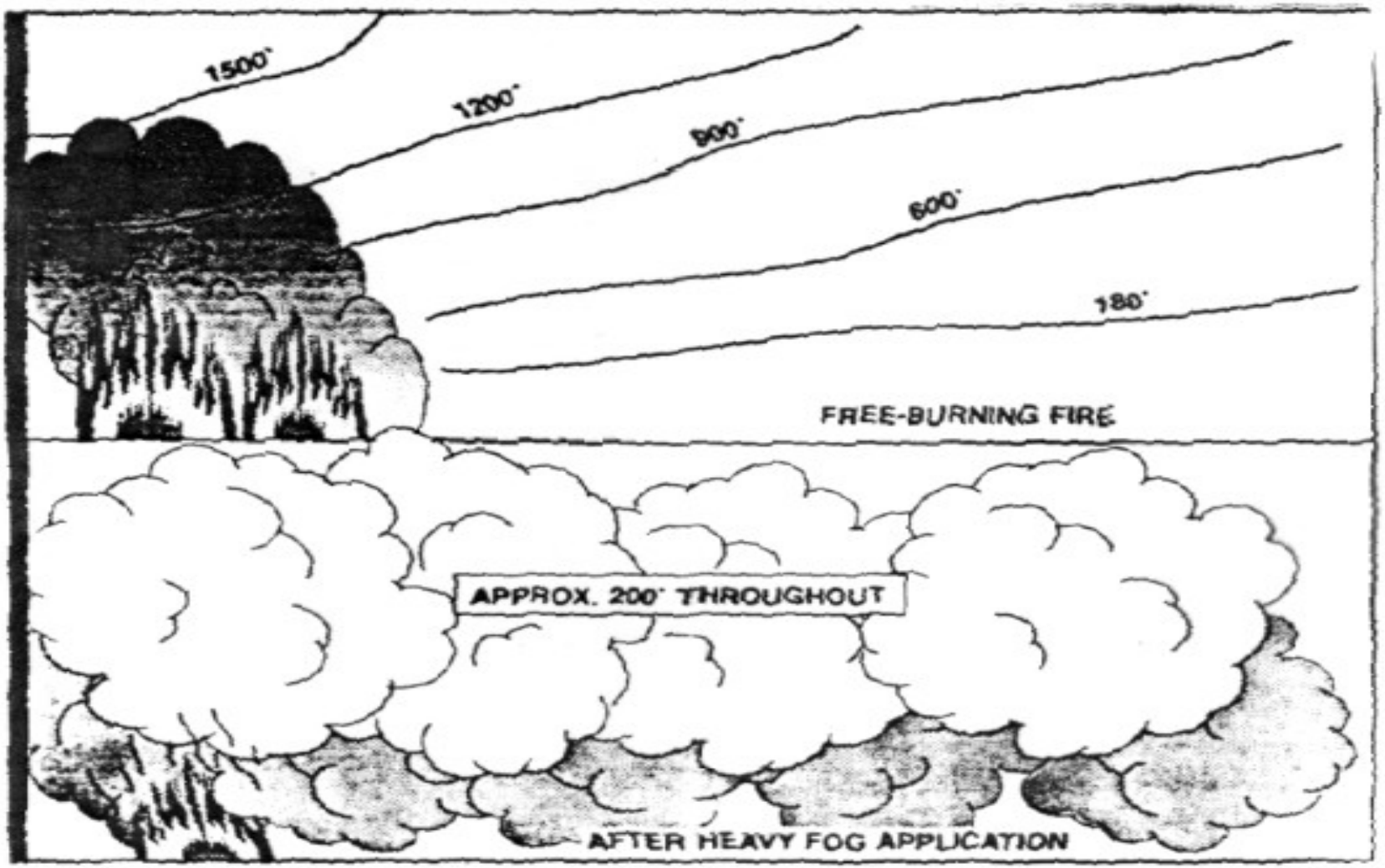
- If mission requirements dictate rapid entry, crawling into the space may be required.
  - Sweep deck with hose stream to clear debris, cool hot surfaces and burning materials, prevent burns and damage to hose lines.
- Access gear may be required to open hot &/or jammed fittings.

FIRE FIGHTING TECHNIQUES
SPACE REENTRY

- Shock hazard in affected space is low. Primary shock hazard is due to direct contact between the firefighter or nozzle and energized electrical equipment.

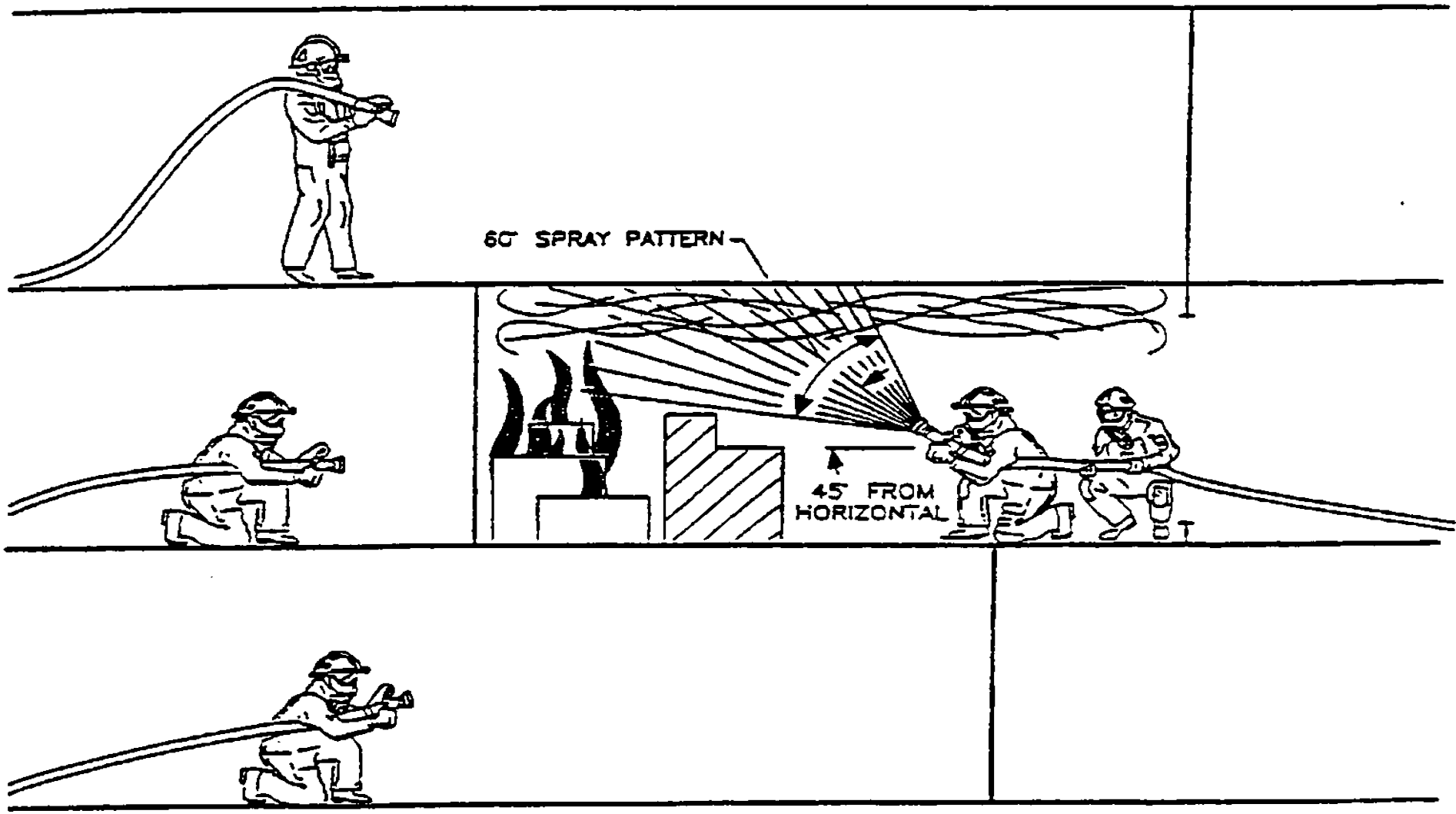
PREFERRED METHOD
ENTER SPACE AND APPLY WATER TO THE SEAT OF THE FIRE

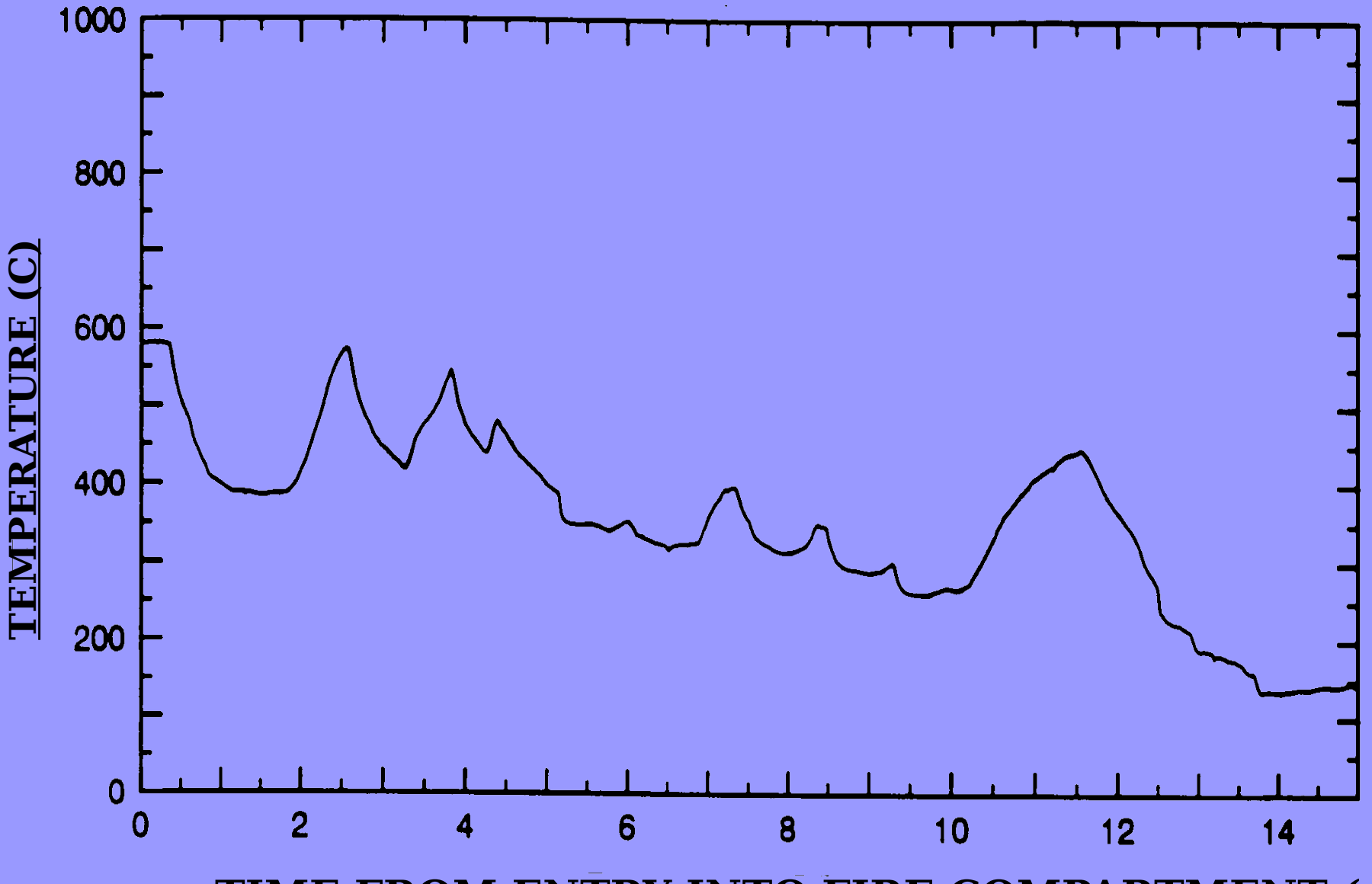


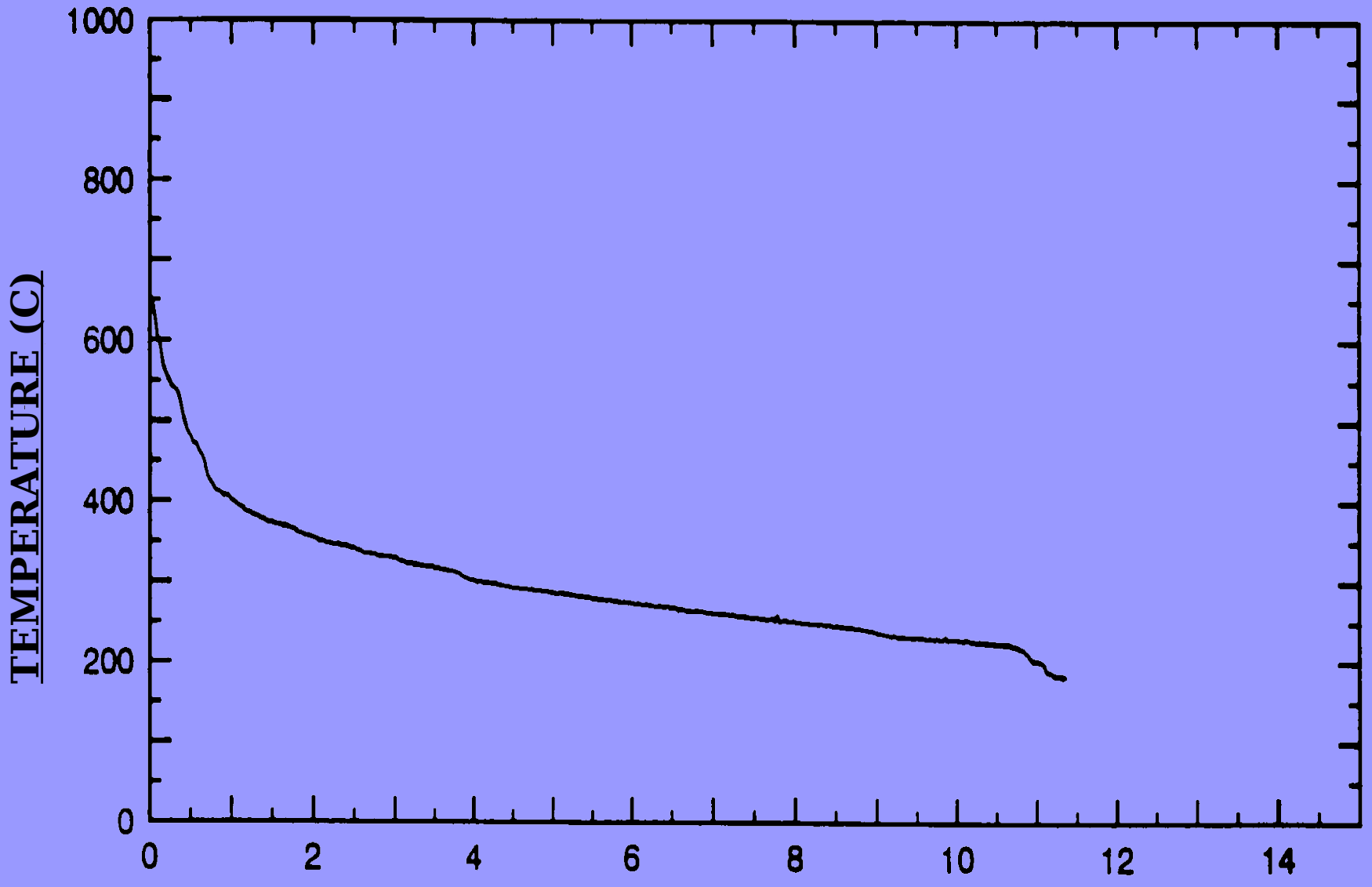


THERMAL LAYER IN FIRE AFFECTED SPACE

F DIRECT APPLICATION OF WATER TO THE SEAT OF THE FIRE IS NOT POSSIBLE ENTER SPACE AND APPLY FOG BURSTS INTO UPPER GAS LAYER




TEMPERATURE (C)
1000
800
600
400
200
0
0
2
4
6
8
10
12
14
TIME FROM ENTRY INTO FIRE COMPARTMENT (min


TEMPERATURE (C)
1000
800
600
400
200
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2
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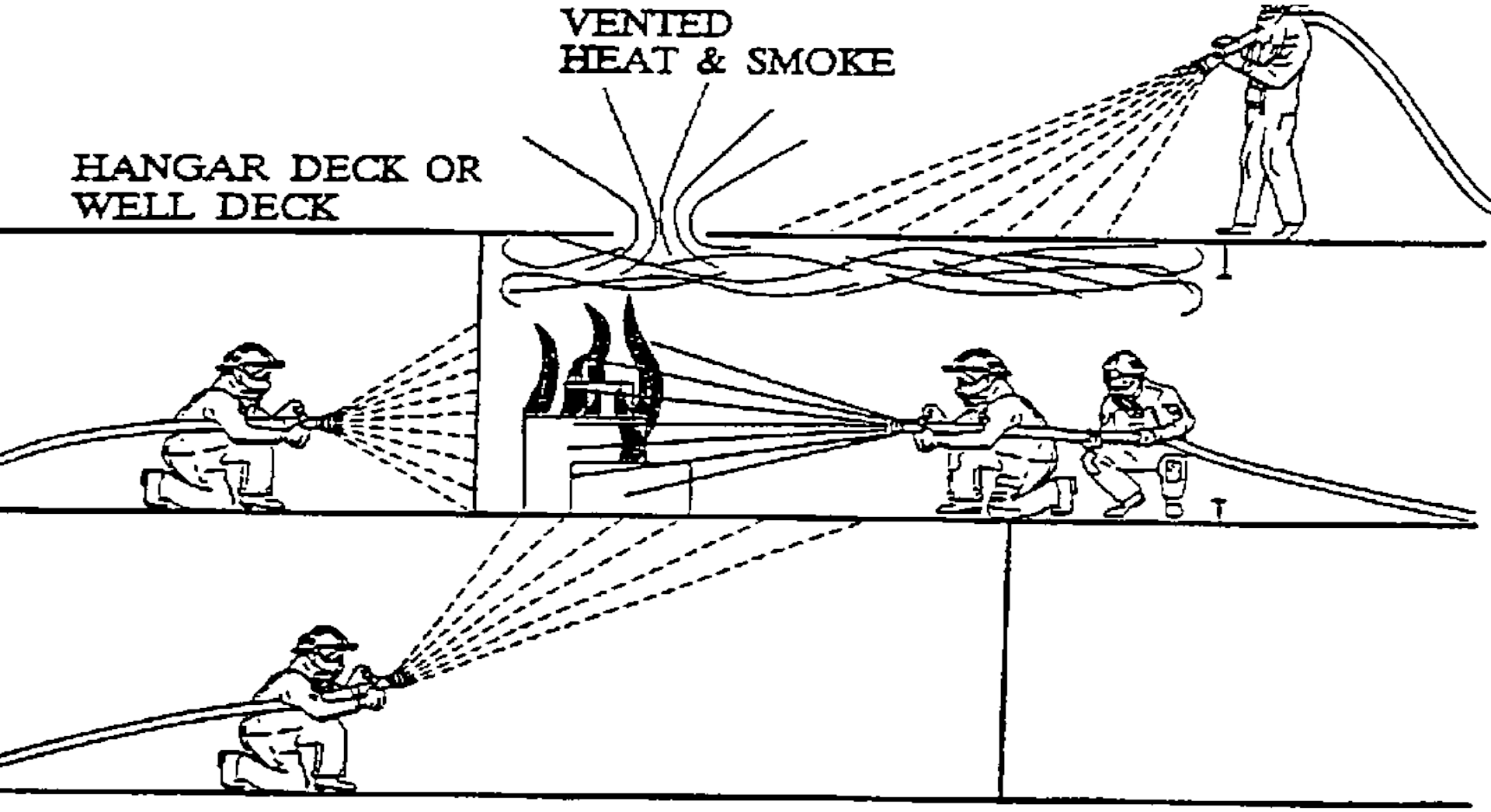
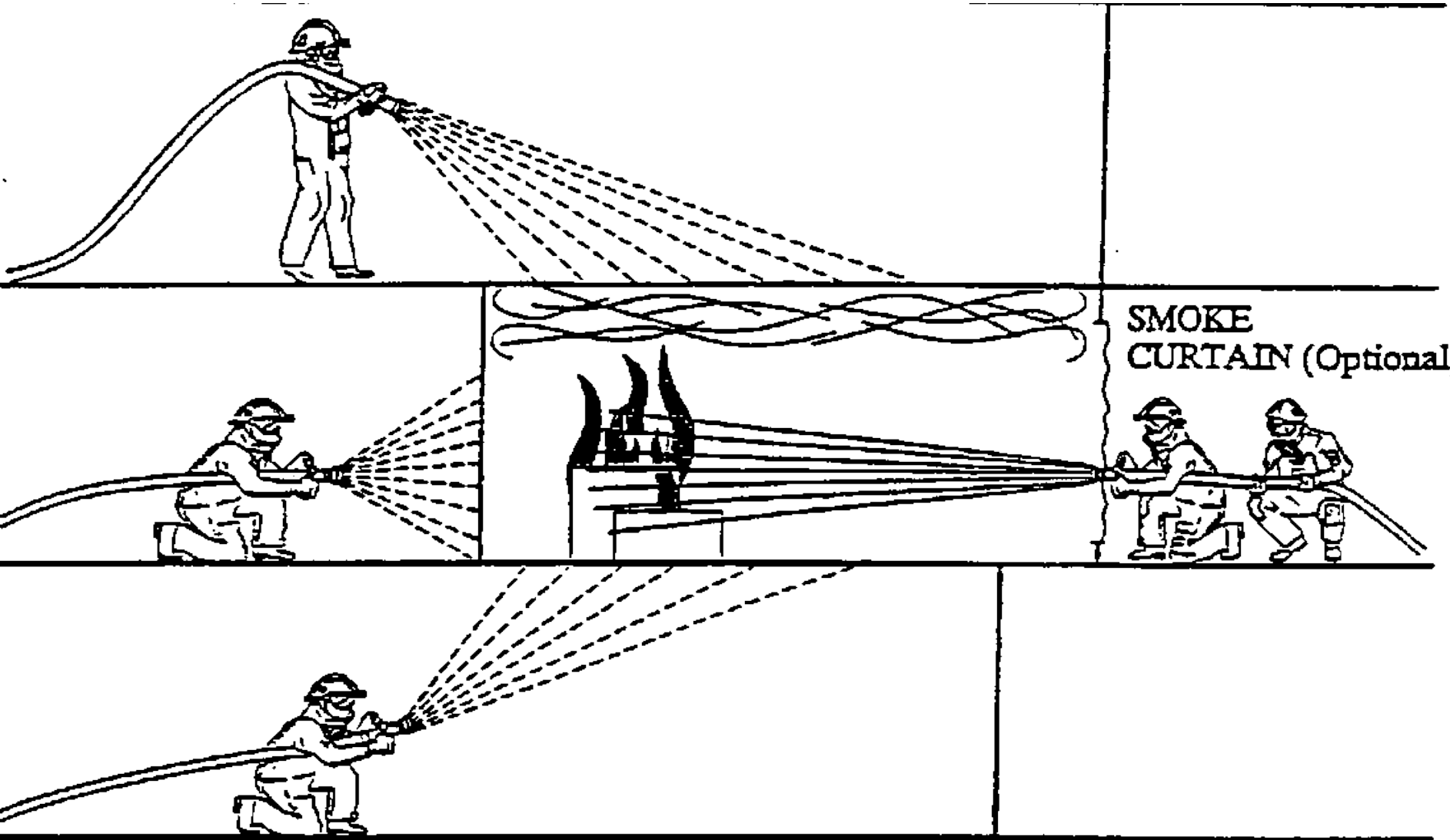
10
12
14
TIME FROM ENTRY INTO FIRE COMPARTMENT (min

IF HIGH TEMPERATURE DENIES ACCESS VENT HEAT TO WEATHER AND CONDUCT DIRECT ATTACK

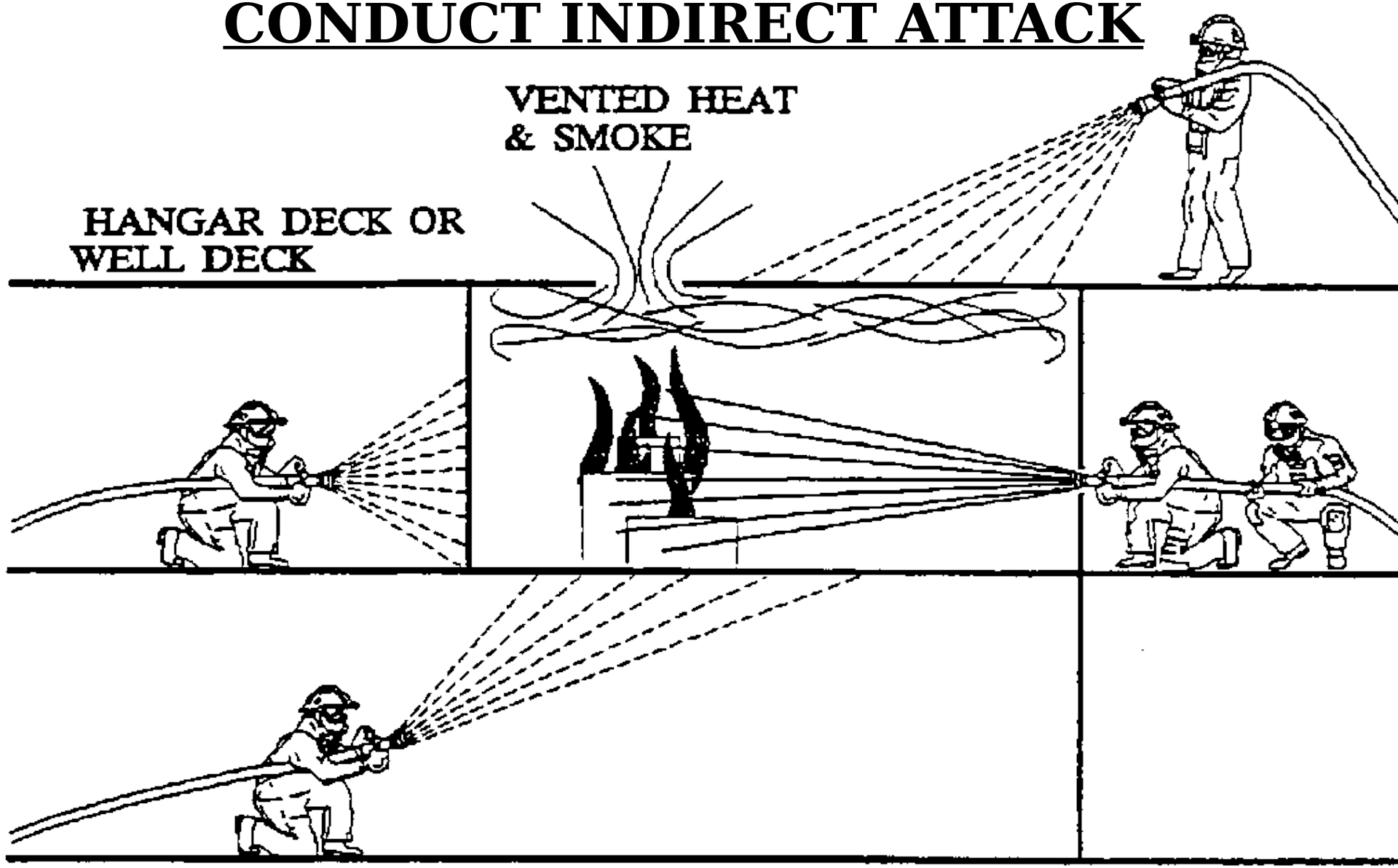


IF HIGH TEMPERATURE DENIES ACCESS

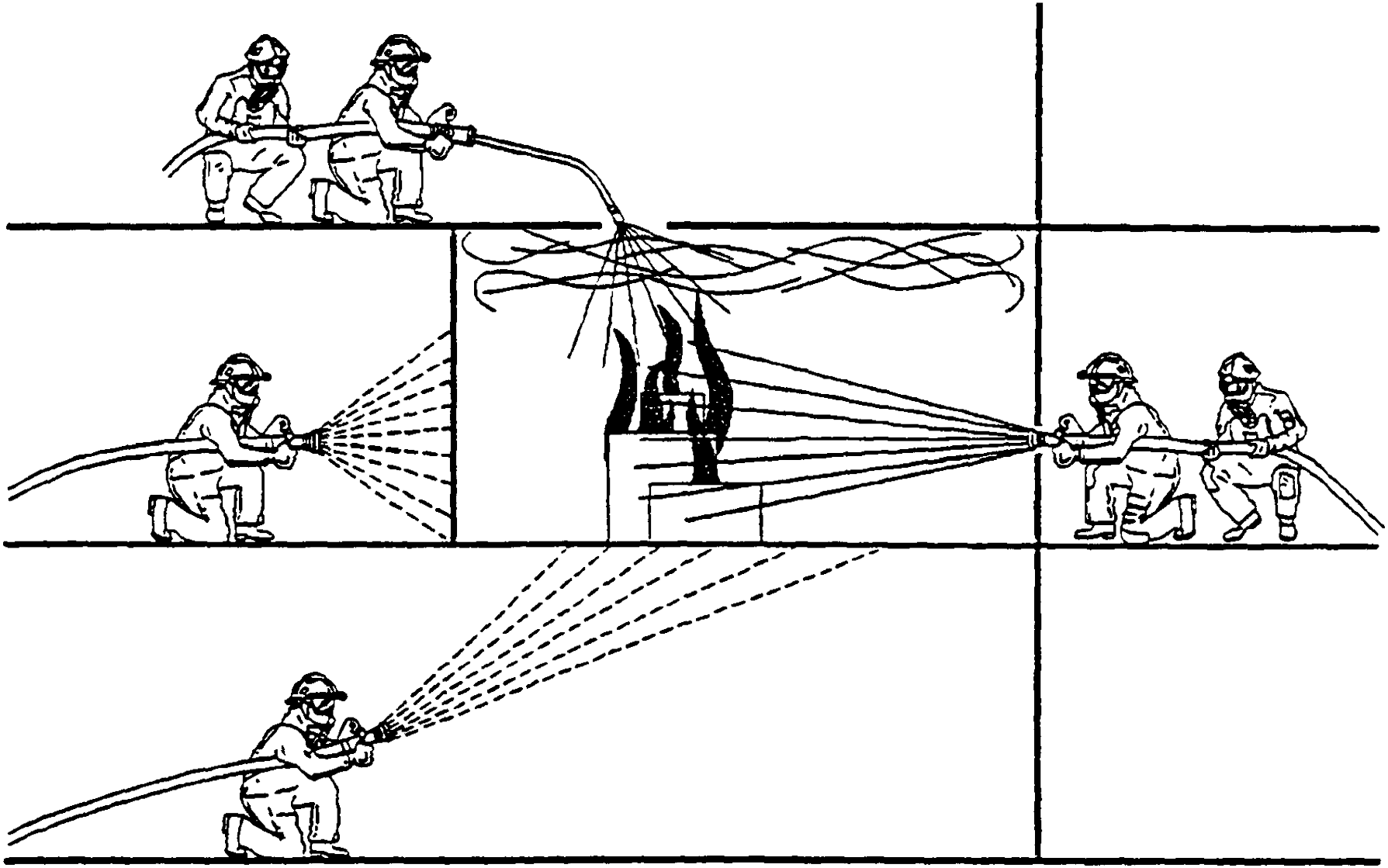
TTACK FROM AN ACCESS WHEN FIRE CAN BE REACHED WITH HOSE STREAM



IF HIGH TEMPERATURE DENIES ACCESS VENT HEAT TO WEATHER AND CONDUCT INDIRECT ATTACK



IF HIGH TEMPERATURE DENIES ACCESS CONDUCT INDIRECT ATTACK



FIRE FIGHTING TECHNIQUES
ATTACKING FROM THE SPACE ABOVE

- When attacking from the space above the following should be considered when conducting either a direct or indirect attack from the hot deck over the fire space.
  - Rotate personnel frequently to avoid heat strain. Emphasis should be on each person or team accomplishing a minor task rather than staying until exhausted.
  - Keep scene leader outside high heat area to prevent impaired judgment and increase endurance.

FIRE FIGHTING TECHNIQUES

ATTACKING FROM THE SPACE ABOVE

- Avoid stationing personnel at local hot spots such as immediately above the fire.
- Utilize support team personnel for indirect cooling and gaining access. These jobs are physically demanding and should not be performed by the primary attack team.
- Using additional gloves for hot surfaces during access may prevent burned hands.

FIRE FIGHTING TECHNIQUES
BACKUP HOSE CONSIDERATIONS

- Decision to layout, man, charge or bring the back-up hose to the scene of the fire made by the OSL based on following:
  - Is a second hose required for fire attack?
  - Are burning gases present in the overhead?
  - Are combustible materials near scene of fire that require cooling?
  - Is protection required for primary attack team due to high probability of explosion?

FIRE FIGHTING TECHNIQUES

ATTACK TEAM RELIEF

- Relieve as a team or individually
- Manage reliefs from a single control point
- Personnel standing by should minimize heat stress while waiting
- Personnel relieved should proceed to fresh air, cool off and replenish body fluids

FIRE FIGHTING TECHNIQUES
FIRE OVERHAUL

- Final Extinguishment / Examination and Cleanup
  - Begin at perimeter and work to point of origin
  - Check for all possible areas of fire spread as well as clues for concealed fires
    - Smoke creeping out of openings
    - Bulkheads hot to touch
    - NFTI inspection results

FIRE FIGHTING TECHNIQUES

VENTILATION OPTIONS

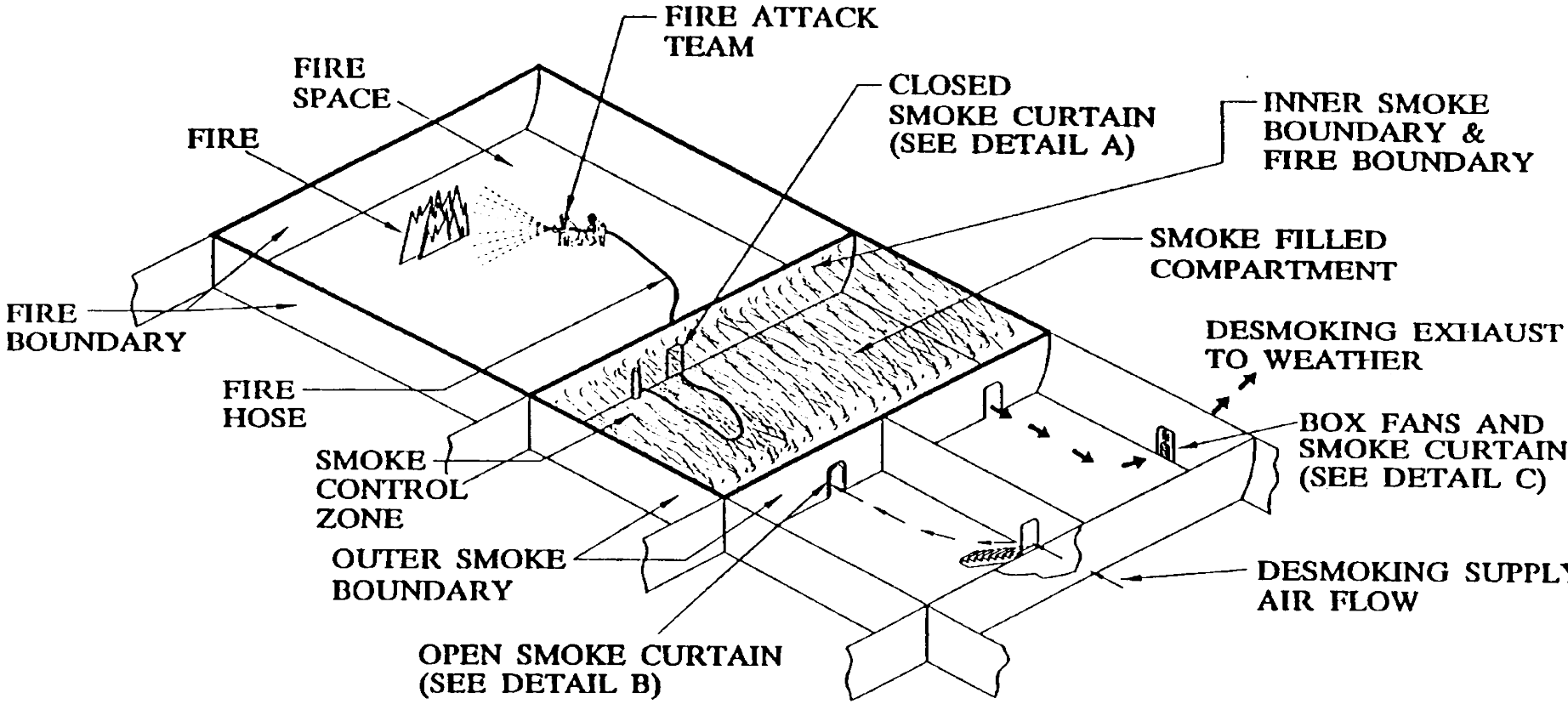
- Vari-nozzle Technique
- Natural Ventilation
- Portable Ventilation
- Active Desmoking
- Installed Ventilation

FIRE FIGHTING TECHNIQUES

ACTIVE DESMOKING

- Authorized for ALL classes of fire
- Used to improve conditions in the smoke control zone
- OSL discretion
- Procedure
  - Prepare desmoking flow path
  - Rig portable exhaust blowers and establish low pressure area
  - Supply make-up air (ship maneuvering may be required)

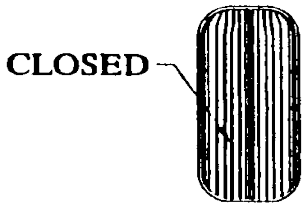
FIRE SPACE, SMOKE BOUNDARY AND SMOKE CONTROL RELATIONSHIPS DURING ACTIVE DE-SMOKING



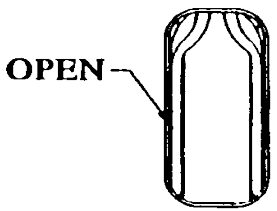
DESMOKING SUPPLY AIR FLOW

DESMOKING EXHAUST

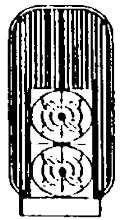
Note: Only selected smoke and fire boundaries are labeled; all smoke and fire boundaries are not labeled.



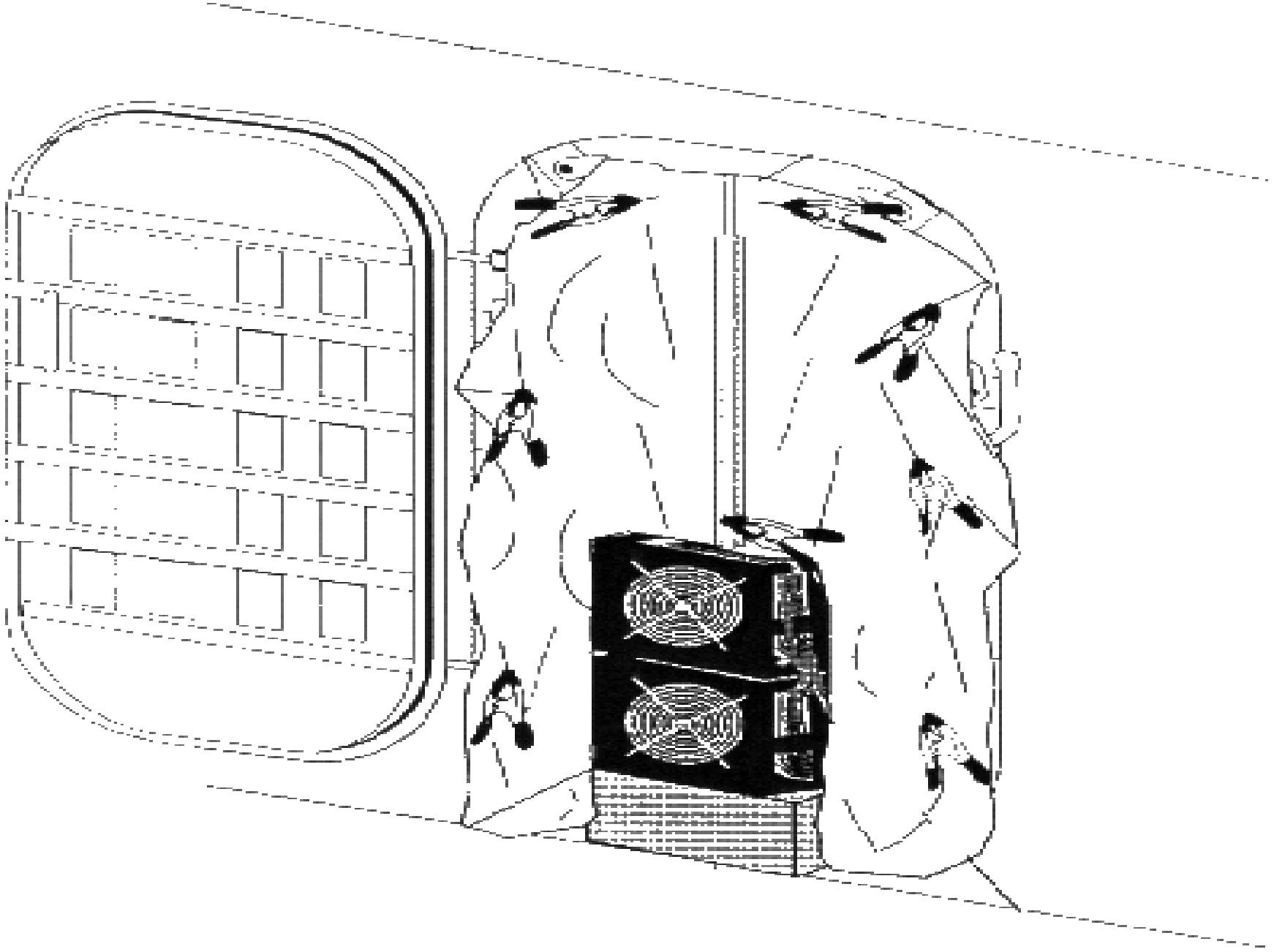
DETAIL A



DETAIL B



DETAIL C



FIRE FIGHTING TECHNIQUES
VENTILATION OPTIONS

- Installed Ventilation
  - LIMITATIONS when used following a Class “A” or “C” fire
    - The fire must be OUT
    - Supply and exhaust ONLY / no recirc allowed
    - No smoldering fires in the ventilation system
    - Vent system must be mechanically and electrically intact
    - CHENG’s permission required

FIRE FIGHTING TECHNIQUES

POST FIRE OVERHAUL

- Final Extinguishment
- Desmoke Space
- Test Atmosphere
  - Refer to NSTM 074 Vol 3
  - Oxygen, Explosives, Toxics
  - What if first O_2 test is 15%?

FIRE FIGHTING TECHNIQUES
POST FIRE OVERHAUL

- Dewater
  - Refer to NSTM 079 Vol 2
  - May be required simultaneously with firefighting

FIRE FIGHTING TECHNIQUES

TYPICAL DIFFICULTIES IN FIRE FIGHTING

- EXTREME Heat
- Firefighter Fatigue
- Limited Access
- Communications Breakdowns
- Limited Visibility
- Personnel Management

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- References: NSTM 300, NSTM 555, EOCC procedure MCFED
- INITIAL ACTIONS (Fire in propulsion plant)
  - Report
  - EOOW order all sources of power secured to affected equipment
  - Attempt to extinguish / control fire using portable extinguishers

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- Firefighting **SHOULD NOT** be delayed awaiting electrical isolation if the person in charge at the scene deems it necessary to prevent the spread of fire or damage.
- EOOW order repair electrician to the scene / switchboard operators to man switchboards (if required).
- Report when all power sources secured.

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- EOOW request RRT / ATSFP as required.
- **A high concentration of CO_2 in any atmosphere is dangerous. Extensive use of CO_2 demands that firefighters use OBA's. Use only the amount of extinguishing agent required.**
- Secure ventilation at scene when/if personnel wearing OBA's arrive.
- Set fire / smoke boundaries.

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- If portable extinguishers are ineffective, attempt to extinguish fire using water in a narrow angle fog pattern from a minimum stand-off distance of 4 feet.
- Use PKP as a means of last resort only on electrical fires.
- If the affected equipment has a vented cover attempt to discharge firefighting agent into vent openings.

FIRE FIGHTING TECHNIQUES

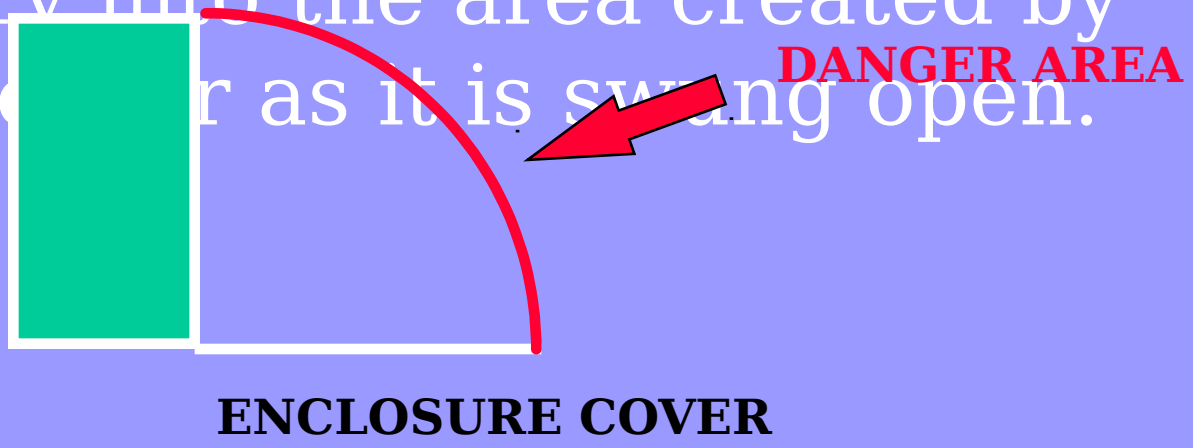
CLASS C FIRE SCENARIO

- If no vent openings exist, repair electrician or person in charge at the scene will authorize the opening of the equipment cover panel. (CO’s permission is not required as extinguishing the fire to minimize further damage is paramount)
  - Don rubber gloves / use insulated tools (if readily available)

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- Use extreme caution not to break the "plane" of the electrical component enclosure. For equipment with switches, meters, relays or other components mounted on the cover which may be energized, the "plane" should be adjusted to include entry into the area created by the arc of the cover as it is swung open.



FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- After the fire is extinguished and verified out, the enclosure cover should be promptly closed and the equipment inspected IAW the deranged equipment checklist.
- Desmoke affected space / Gas free as required
- Secure fire and smoke boundaries
- Tag out affected equipment

FIRE FIGHTING TECHNIQUES

CLASS C FIRE SCENARIO

- A Class C fire outside the propulsion plant will be attacked in much the same manner except the crewmember who discovers the fire will not have the advantage of having completed numerous Engineering Casualty Control drills. Ship success in extinguishing this fire depends on how well you train the crew.

FIRE FIGHTING TECHNIQUES

IN A CBR ENVIRONMENT

- Most likely scenario:
  - Direct hit by a penetrating weapon delivering a chemical agent. (Fire caused by warhead or unexpended missile fuel)
  - BIO agent unlikely because agent would most likely be destroyed by the fire.
  - Vapor agent most likely rendered ineffective by the fire.

FIRE FIGHTING TECHNIQUES

IN A CBR ENVIRONMENT

- Main machinery rooms are usually “limited protection zones” maintained at atmospheric pressure with supply ventilation being filtered to remove only liquid or solid contaminants.
  - MCU-2/P only protection required.

FIRE FIGHTING TECHNIQUES

IN A CBR ENVIRONMENT

- Dress out firefighters in FFE in lieu of CPO suits
- FFE does not offer complete protection from BW/CW effects
- Tests indicate that switching OBA canisters is simpler and requires less risk than switching from the OBA to the MCU-2P and back

NOTE: There is no reference document that r
to dress out in this manner. On site risk asse
critical.

IN SUMMARY

- INITIAL ACTIONS
- ISOLATE EQUIPMENT / SYSTEMS
- FIRE BOUNDARIES
- SMOKE BOUNDARIES
- SCENE LEADER THOUGHT PROCESS
- HOSE HANDLING
- ATTACK OPTIONS

IN SUMMARY

- OVERHAUL PROCEDURES
- ACTIVE DESMOKING
- VENTILATION OPTIONS
- TYPICAL DIFFICULTIES IN FIREFIGHTING
- CLASS C FIRE SCENARIO
- FIREFIGHTING IN A CBR ENVIRONMENT

REVIEW QUESTION

- WHAT CONSTITUTES A PRIMARY FIRE BOUNDARY? WHAT IS THE GOAL BEHIND SETTING THEM?
- ANY SOLID PHYSICAL BOUNDARY IMMEDIATELY SURROUNDING ALL SIX SIDES OF THE FIRE AFFECTED SPACE
- PREVENT THE SPREAD OF FIRE

REVIEW QUESTION

- WHERE CAN YOU GET ADDITIONAL PERSONNEL TO ASSIST IN SETTING FIRE BOUNDARIES?
- AT SEA: REPAIR LOCKERS
- INPORT: MUSTER POINT (MESS DECKS) “ON BOARD ON DUTY”

REVIEW QUESTION #3

- LIST THREE PRIMARY ACTIONS TO BE TAKEN BY A CREW MEMBER WHO DISCOVERS A FIRE.
- REPORT THE FIRE
- EVACUATE PERSONNEL FROM THE AREA
- ISOLATE / CONTAIN
- ATTACK FIRE WITH AVAILABLE EQUIPMENT

REVIEW QUESTION

- WHAT ACTIONS SHOULD BE TAKEN BY A BOUNDARYMAN TO PREVENT THE SPREAD OF FIRE?
- REMOVE COMBUSTIBLES
- PROVIDE LOCAL COOLING

REVIEW QUESTION

- WHO AUTHORIZES OPENING THE ENCLOSURE COVER OF A PIECE OF FIRE AFFECTED ELECTRICAL EQUIPMENT?
- The repair electrician or person in charge at the scene. (CO’s permission is not required as extinguishing the fire to minimize further damage is paramount)

REVIEW QUESTION

- WHAT ARE THE DCA’s RESPONSIBILITIES WITH REGARD TO VENTILATION SYSTEMS WHILE FIGHTING A FIRE IN A CBR ENVIRONMENT ?
- RESPONSIBLE FOR ORDERING SYSTEMS SECURED BASED ON LOCATION AND STATUS OF FIRE, STATUS OF CBR BOUNDARIES AND PROTECTION ZONE INTEGRITY.

FIRE FIGHTING TECHNIQUES

UNIT 5.4